

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Karousel LLC)	IBFS File No. SAT-LOA-20161115-00113
)	Call Sign S2980
)	

KAROUSEL LLC’S RESPONSE TO COMMENTS AND OPPOSITION TO PETITIONS

Karousel LLC (“Karousel”) hereby responds to the comments and the petitions to deny or impose conditions filed by the applicants for planned non-geostationary satellite orbit (“NGSO”) satellite systems in the above-captioned applications.

BACKGROUND

Karousel seeks to launch and operate an NGSO fixed satellite service (“FSS”) system as part of an innovative satellite-based video and data distribution platform. Karousel’s system will operate in an elliptical, geosynchronous orbit with a high degree of inclination to the Earth and operations in the 10.7-12.7 GHz, 14.0-14.5 GHz, 17.8-19.3 GHz, 19.7-20.2 GHz, and 27.5-30.0 GHz bands. The Karousel system will combine satellite-delivered content and data with a terrestrial caching and storage system to allow users to consume video and other content at their convenience—without the latency, buffering, network outages or other limitations of real-time streaming services.

Karousel’s system will offer significant facilities-based competition in the market for over-the-top video programming services, particularly for Americans who lack reliable high-capacity economical wireline or wireless broadband connectivity. The Karousel system will alleviate congestion for other broadband networks by providing an alternative distribution platform for data-intensive Internet traffic, particularly video traffic—which is predicted to

account for over 80% of all Internet traffic by 2018.¹ Karousel's system can also help bridge the urban-rural divide by offering new entertainment options to Americans, typically in rural areas, who may otherwise lack sufficient connectivity for over-the-top video services. In addition, Karousel plans to offer enterprise data distribution services to government and commercial users.

NGSO systems present exciting opportunities to deploy innovative platforms and services that will provide substantial benefits for consumers. Maximizing the benefits to consumers of deploying multiple NGSO systems inevitably will require coordination, and Karousel has fully committed to coordinate with other authorized users in these spectrum bands to avoid harmful interference. Karousel has also designed its system to be robust to interference; for example, Karousel has designed its system to withstand service disruptions in the event of episodic periods without connectivity between the ground and space segments of its system. Other design features of Karousel's system also offer significant flexibility to ensure interference protection, and will facilitate effective coordination with other primary users of these bands.

None of the comments or petitions filed by other applicants establish any meaningful concerns at this stage about Karousel's proposed system, nor do they establish that traditional coordination mechanisms will not effectively prevent harmful interference. Karousel looks forward to launching its innovative video and data distribution platform, and coordinating with other operators to maximize the public interest benefits of NGSO systems.

I. The Commission Should Follow Its Traditional Approach of Allowing the Marketplace to Determine the Best Use of Spectrum

Karousel's highly adaptable network architecture envisions a limited number of NGSO satellites to reduce the potential for satellite anomalies and limit the risk, complexity and cost of

¹ *VNI Complete Forecast Highlights Tool, United States*, CISCO, <http://bit.ly/1U45JDS> (last visited July 1, 2017).

sustaining an unprecedentedly large number of space stations in orbit for an extended period of time. Space Exploration Technologies Corp. (“SpaceX”), however, has filed comments that urge the Commission to favor SpaceX’s system design and business plan over those of every other applicant in this proceeding, including Karousel.² SpaceX makes broad and indiscriminate claims about the purported “efficiency” of its own system relative to Karousel and urges the Commission to favor SpaceX’s system over other proposals.³ SpaceX’s purported “efficiencies” relative to other less complex systems are speculative at best.

The Commission has long recognized that “[r]egulatory policies must promote technological neutrality, competition, investment, and innovation to ensure that broadband service providers have sufficient incentive to develop and offer such products and services.”⁴ As Chairman Pai has noted, “consumers benefit most from competition,” and “free markets have delivered more value to American consumers than highly regulated ones.”⁵

² SpaceX filed comments in response to almost all of the competing applications, arguing in one form or another that SpaceX’s system is more sophisticated or spectrally efficient than those of its competitors. *See* Comments of Space Exploration Technologies Corp., Karousel LLC, File No. SAT-LOA-20161115-00113 (filed June 26, 2017) (“SpaceX Comments”); *see also* Comments of Space Exploration Technologies Corp., The Boeing Co., File No. SAT-LOA-20161115-00109 (filed June 26, 2017); Comments of Space Exploration Technologies Corp., LeoSat MA, Inc., File No. SAT-PDR-20161115-00112 (filed June 26, 2017); Comments of Space Exploration Technologies Corp., O3b Limited, File No. SAT-AMD-20161115-00116 (filed June 26, 2017); Comments of Space Exploration Technologies Corp., Space Norway AS, File No. SAT-PDR-20161115-00111 (filed June 26, 2017); Comments of Space Exploration Technologies Corp., Telesat Canada, File No. SAT-PDR-20161115-00108 (filed June 26, 2017); Comments of Space Exploration Technologies Corp., Theia Holdings A, Inc., File No. SAT-LOA-20161115-00121 (filed June 26, 2017); Comments of Space Exploration Technologies Corp., ViaSat, Inc., File No. SAT-PDR-20161115-00120 (filed June 26, 2017).

³ SpaceX Comments at 3.

⁴ *See* Strategic Plan of the FCC | Federal Communications Commission, <https://www.fcc.gov/general/strategic-plan-fcc> (last visited June 28, 2017).

⁵ FCC Chairman Ajit Pai | Federal Communications Commission, <https://www.fcc.gov/about/leadership/ajit-pai> (last visited July 6, 2017).

To promote technological neutrality and competition, the Commission traditionally has not made qualitative judgments about the relative strengths of various satellite systems and business plans prior to granting licenses—for good reason.⁶ For the Commission to engage in qualitative judgments about systems would require a highly subjective assessment of system design and would deter NGSO applicants from pursuing flexible and innovative designs. Moreover, if the Commission were to establish preferences for particular system designs, that decision would constitute a significant policy determination that should not be resolved in the context of this processing round.

Even if the Commission were to engage SpaceX’s efficiency claims, it is far from clear that SpaceX’s plan provides any efficiency advantages over Karousel’s. “There are many possible definitions for spectrum efficiency,” including technological and economic efficiency.⁷ Many features of Karousel’s design ensure efficient use of spectrum, such as spatial separation and antenna discrimination of the Karousel uplink antennas, as well as Karousel’s system design that uses the same spectrum for both service links and feeder links on a switchable basis. Karousel’s data carousel also creates a highly efficient method to deliver data and media content to underserved segments of the population and will create significant economic benefits for consumers and efficiencies for other networks. The Commission may well decrease the overall

⁶ See, e.g., *Bechtel v. FCC*, 10 F.3d 875, 886 (D.C. Cir. 1993) (noting that “the ability to pick persons and firms who will be ‘successful’ at delivering any kind of services is a rare one, however success might be defined; that is why it commands generous rewards in the market” and that the FCC “has often implicitly recognized [this] difficulty, noting the advantages of allowing stations to shift by voluntary transactions into what are presumptively more capable hands (and if not, to shift again)”).

⁷ See Spectrum Policy Task Force, Federal Communications Commission, Report of the Spectrum Efficiency Working Group 4-6 (Nov. 15, 2002), https://transition.fcc.gov/sptf/files/SEWGFfinalReport_1.pdf.

efficiency of the Ka-band if it forecloses access to Karousel and other applicants in favor of SpaceX's proposed system.

The more salient point, however, is the Commission's longstanding policy against substituting its judgment for that of the market by making comparative judgments about the merits of one system over another when such a decision is not expressly required by Congress. Apart from the likelihood of substantive error in decision-making, the process of identifying one system as comparatively superior to another has historically required three to five years to complete, which represents a lifetime in an innovative and fast-moving industry. The process SpaceX envisions would also require considerable agency resources and, even once the Commission issues a decision, the process would remain subject to considerable uncertainty because the judgment has been frequently the subject of extensive judicial review.⁸ In any case, this processing round is not the proper venue to balance the relative efficiencies of various systems, or to enact the significant change in policy to effect a new form of comparative hearing process that SpaceX appears to contemplate. The market—not the Commission—should determine the success of any of the NGSO systems, and there is no sound legal or policy basis for the Commission to make that determination in advance.

II. Commonly Used Coordination Mechanisms Can Accommodate the NGSO Systems Proposed in the Processing Round

SpaceX also offers exaggerated claims about potential interference and only minimal acknowledgement that coordination can address its concerns. SpaceX argues, for example, that

⁸ See, e.g., *Implementation of Section 309(j) of the Communications Act – Competitive Bidding for Commercial Broadcast and Instructional Television Fixed Service Licenses, et al.*, First Report and Order, 13 FCC Rcd 15920 ¶¶ 36-37 (1998) (noting that routine comparative proceedings can take from three to five years or more to complete and more complex cases could take much more time, and that “[d]etermining which [comparative] criteria could best survive [judicial] scrutiny and determining how such criteria should now be weighted is a difficult process that no doubt would lead to serious challenges in the courts with the outcome unclear.”).

there may be interference from a satellite in a highly elliptical orbit to one in low Earth orbit “without effective coordination.”⁹ But SpaceX offers no sound reason, particularly at this pre-licensing stage, to presume that traditional coordination mechanisms will not prove effective. Indeed, as an applicant that proposes to deploy more than 4,000 satellites, SpaceX should be emphasizing its willingness to coordinate with others rather than resisting long-established norms of coordination.

As a threshold matter, Karousel agrees that reliable, up-to-date ephemeris data would improve any engineering and technical solutions to in-line interference. Karousel therefore supports a requirement to provide more frequent ephemeris data than the three days required by the Commission’s rules.¹⁰ Current data from all NGSO systems will minimize interference risks for all deployed systems.

In any event, SpaceX’s dim view of coordination has no justification. SpaceX claims that Karousel’s large spot beams will force others to “shoulder the burden of avoiding ... in-line events.”¹¹ SpaceX’s claim is not a fair conclusion to draw from Karousel’s application. Prevention of interference through coordination will be eminently feasible.

First, Karousel’s system is designed to be robust to interference, such that Karousel’s system can continue to operate effectively in circumstances when it receives interference. Karousel’s data correction methodology is designed to operate effectively notwithstanding the infrequent and short durations when transmissions may be interrupted.

⁹ SpaceX Comments at 9.

¹⁰ See *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, Notice of Proposed Rulemaking, IB Docket No. 16-408, ¶ 25 (rel. Dec. 15, 2016) (“*NGSO NPRM*”).

¹¹ SpaceX Comments at 3.

Second, and more importantly, SpaceX's overstatements about potential interference into its own planned constellation ignore the reality that the Commission's coordination rules, and a long track record of coordination among affected parties, have proven successful for many years.¹² There are many technical mechanisms that have been employed to successfully prevent harmful interference, such as intelligent siting of gateways, precise control of uplink antenna pointing, antenna discrimination, power control of terminals, muting of transmissions, robust and adaptive error correction techniques, packet re-transmission, and other, similar practices. Karousel has committed to comply with the Commission's coordination rules and is fully prepared to coordinate with others to manage any in-line interference concerns.¹³

Ultimately, the implication of SpaceX's position is that no other NGSO systems should be permitted to use the spectrum frequencies other than SpaceX. This position has no basis in law or policy. At its logical extreme, it would result in monopolistic NGSO access to the relevant frequencies. The long history of successful coordination among satellite systems belies SpaceX's exclusionary approach. The Commission should follow its long-successful policy and allow competition and innovation to thrive in a burgeoning new market for NGSO services.

III. The Commission Should Reject Telesat's Petition to Deny

Telesat's petition, like SpaceX's, gives little weight to coordination efforts, despite their long history of success. The Commission accordingly should reject Telesat's claim that

¹² See, e.g., NATIONAL SPECTRUM MANAGERS ASSOCIATION, PRIMER ON FREQUENCY COORDINATION PROCEDURES, Report WG 3.87.001, Introduction (May 1987), <http://nsma.org/wp-content/uploads/2016/05/3-87-01.pdf> (noting how frequency coordination "has proven very effective in permitting the resolution of potential interference problems" since the early 1970s).

¹³ See Karousel LLC, Application, File No. SAT-LOA-20161115-00113 at 55 (filed Nov. 15, 2016) (noting that "Karousel commits to coordinate in good faith and with other authorized users in these bands" under 47 C.F.R. § 25.261).

Karousel’s application should be denied based on the hypothetical prospect of interference. The Commission’s coordination rules are sufficient to address Telesat’s concerns.

The Commission should also reject Telesat’s “first-in-time” theory that supposedly gives its NGSO system priority over subsequent filings—including all of the applications in this processing round.¹⁴ Telesat’s request would improperly revise the procedural rules that applicants understood would apply to the current processing round. The FCC has historically asked satellite operators to post a bond, which escalates based on the length of time between license grant and default.¹⁵ The ITU, by comparison, maintains a registry of satellite networks with priority assigned on a first-come, first-served basis and systems are declared operational as soon as the first satellite in a constellation is launched.¹⁶

Neither of these models for establishing priority within a band was designed for constellations comprised of hundreds or thousands of satellites in a single band. Moreover, using either approach would prove especially ill-suited to a processing round such as this one which involves satellite constellations that include systems with both small and large numbers of satellites in their respective constellations.

As SES and O3b note, a processing round intended to consider the adequacy of applications that are seeking access to spectrum and orbital resources necessary to commence

¹⁴ See Telesat Canada Petition to Deny, IBFS File No. SAT-LOA-20161115-00113 at 3 (filed June 26, 2017).

¹⁵ See 47 C.F.R. § 25.165; *Comprehensive Review of Licensing and Operating Rules for Satellite Services*, Second Report and Order, 30 FCC Rcd 14713 (2015).

¹⁶ See generally ITU, Radio Regulations Arts. 9, 11 (2016 ed.).

service is not the proper forum to address what role, if any, that ITU priority should play in establishing superior rights in the coordination process in the United States.¹⁷

Should the FCC nonetheless elect to consider a novel role for ITU date priority in the context of an FCC processing round, Telesat's proposal to elevate the much-maligned international date-priority system above the FCC's results-oriented approach will discourage deployment and invite regulatory gaming. Coordination will be important for all deployed NGSO FSS systems, and an ITU date-priority system would give earlier-filed applicants, such as Telesat, less incentive to reach mutually beneficial coordination agreements with later-filed applicants. The Commission should therefore deny Telesat's petition.

IV. EIRP Density and Aggregate EPFD Limits, if any, Are Better Addressed in the Rulemaking Proceeding

Finally, SpaceX emphasizes the “critical” need for EIRP density limits to facilitate “equitable spectrum sharing among non-homogenous [*i.e.*, HEO and LEO] NGSO systems” as a basis to seek conditions on Karousel's application.¹⁸ SpaceX's newfound concern for EIRP density limits is odd. In the *NGSO NPRM* proceeding, SpaceX acknowledged that “adopting such limits at this early stage in the development of NGSO systems could constrain ongoing technological development and future innovation.”¹⁹

The Commission has sought comment on EIRP density limits in the *NGSO NPRM*.²⁰ While some have sought more stringent limits,²¹ the majority of commenters support EIRP

¹⁷ See Reply Comments of SES S.A. and O3b Limited, IB Docket No. 16-408 at 26-27, nn. 118 & 120 (filed Apr. 10, 2017).

¹⁸ SpaceX Comments at 9.

¹⁹ See Reply Comments of Space Exploration Technologies Corp., IB Docket No. 16-408 at 13 (filed Apr. 10, 2017).

²⁰ See *NGSO NPRM* ¶¶ 28-30.

density limits for NGSOs that are no more stringent than those that apply to GSOs.²² Karousel would prefer flexibility for NGSO systems given their nascent stage of development. At a minimum, any default EIRP density limits should be no more restrictive than the limits applicable to GSO FSS earth station licensees (in the perpendicular plane).²³ But more importantly, the Commission should decide this issue in its ongoing, generally applicable rulemaking proceeding rather than prematurely granting or denying individual applications based on hypothetical concerns.²⁴

Respectfully submitted,

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²¹ See Comments of LeoSat MA., Inc., IB Docket No. 16-408 at i (filed Feb. 27, 2017); Comments of SES S.A. and O3b Ltd., IB Docket No. 16-408 at 27-28 (filed Feb. 27, 2017); Comments to the Notice of Proposed Rulemaking, Space Norway SA, IB Docket No. 16-408 at 13 (filed Feb. 27, 2017).

²² Comments of The Boeing Co., IB Docket No. 16-408 at 15-17 (filed Feb. 27, 2017); Comments of OneWeb, IB Docket No. 16-408 at 27-28 (filed Feb. 27, 2017); Reply Comments of Space Exploration Technologies Corp., IB Docket No. 16-408 at 13-14 (filed Apr. 10, 2017); Comments of Telesat Canada, IB Docket No. 16-408 at 17 (filed Feb. 27, 2017).

²³ See 47 C.F.R. § 25.138(a)(2).

²⁴ ViaSat's Petition to Deny or Impose Conditions should be denied for the same reasons. See Petition to Deny or Impose Conditions of ViaSat, Inc., IBFS File No. SAT-LOA-20161115-00117, *et al.* (filed June 26, 2017). ViaSat's concerns related to potential interference into adjacent GSO operations and the need for aggregate EPFD limits are better left to the *NPRM*. See *NGSO NPRM* ¶¶ 18-21.

CERTIFICATE OF SERVICE

I, Alexander Maltas, hereby certify that on July 7, 2017, a true and correct copy of Karousel LLC's Response to Comments and Oppositions to Petitions was sent to the following:

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